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To cite this article: Joshua M. Heyes & Berry Billingsley (17 Jan 2023): The role of biology teachers in epistemically insightful health and wellbeing education: a case study of the English relationships, sex and health education curriculum, Journal of Biological Education, DOI: [10.1080/00219266.2022.2157860](https://doi.org/10.1080/00219266.2022.2157860)

To link to this article: <https://doi.org/10.1080/00219266.2022.2157860>



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Published online: 17 Jan 2023.



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The role of biology teachers in epistemically insightful health and wellbeing education: a case study of the English relationships, sex and health education curriculum

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ABSTRACT

In the period following a global pandemic, the promotion of health and wellbeing is a priority area for schools. This accompanies growing calls for health and wellbeing education to be delivered through a whole-child/whole-school approach that connects across subject areas. While it may be clear to most people that a purely scientific sexuality education is undesirable, it is also clear that biology plays a vital role in developing students' understanding about a variety of health and wellbeing topics, including those around sex, sexuality and sexual health. In this article, we explore the contribution of the biology teacher to an integrated health and wellbeing education in schools through a case study comparison of the English Relationships, Sex and Health Education curriculum and the English biology curriculum. Biology teachers in England and many other national and regional jurisdictions operate in a compartmentalised system which can create frustration and anxiety for both students and teachers when navigating the complexities of how sensitive topics are delivered in different disciplinary siloes. Epistemically insightful approaches, conceptualised at the macro-, meso- and micro-level of school organisational structures, may provide a way for biology teachers and educational leaders to address and overcome some of these challenges.

ARTICLE HISTORY

Received 08 June 2022
Accepted 17 October 2022

KEYWORDS

health and wellbeing;
sexuality education; sexual
health; gender; epistemic
insight; interdisciplinary
education

Introduction

The promotion of health and wellbeing (HWB) in schools is a critical and emerging agenda across education systems worldwide, particularly in the period following a global pandemic (MacCullum and White 2021). In the UK context, both Scotland (Curriculum for Excellence) and Wales (Curriculum for Wales) include HWB as a distinctive interdisciplinary area in their new curriculum frameworks (Horrell, Sproule, and Gray 2012). These developments are situated within broader shifts in curriculum reform, in both the UK and beyond, away from subject compartmentalisation towards more integrated approaches to learning (Hannon et al. 2018).

Inter, multi and transdisciplinary approaches to teaching and learning have growing currency within this changing landscape, with a range of existing research exploring and advocating for a more interdisciplinary biology education (Nagle 2013). Such approaches resonate with research into epistemic insight, defined as the 'knowledge about knowledge' needed to understand the similarities and differences between the different disciplinary perspectives represented in schools and how they work together to address 'Big Questions' about the nature of reality and human

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personhood (Billingsley et al. 2018). Epistemic insight sits within a broader ‘family’ of inter, multi and transdisciplinary approaches to education, while offering a distinctive set of orientations, emphases and preferred pedagogies. The Epistemic Insight Curriculum Framework (Figure 1) outlines a progressive approach for building three key strands of understanding, including the nature of science, relationships between science and religion, and different ways of knowing (Billingsley 2021).

Within the broad swathe of possible disciplinary combinations, epistemic insight research has focused primarily on how ‘Big Questions’ about the nature of reality and human personhood can create bridges between science and other areas of the curriculum, including but not limited to, religious studies (Billingsley & Nassaji 2021). More recent research on epistemic insight has focused on the educational potential of unstructured real-world problems for building epistemic insight across scientific and non-scientific perspectives (Billingsley & Heyes 2022). For example, loneliness has been receiving increased media attention in the period following a global pandemic in which many were forced to isolate themselves. Loneliness has been found to have important neurobiological correlates (Lam et al. 2021), with some pharmaceutical research seeking to develop a so-called ‘pill for loneliness’ (Entis 2019). As with other mental health problems, biology provides an important perspective that enables a range of important and helpful interventions. However, clearly other subjects typically taught in schools also have important contributions to make.

Biology evidently plays a vital part amongst the growing chorus of voices calling for improved health and wellbeing education in schools. The goal of this paper is to outline the importance of an epistemically insightful approach to biology education within an integrated HWB education, using a case study of the new English Relationships Sex and Health Education (RSHE) curriculum, implemented in 2021.

Opportunities and barriers for health and wellbeing education

A number of conceptual and practical barriers exist to the goal of an epistemically insightful HWB education; that is, one that draws on insights offered by Biology in dialogue with other disciplinary perspectives. In schools, HWB topics, such as sexuality, gender, religious identity, hormones, puberty, anorexia and obesity, will be approached very differently depending on which curriculum subject children are in at the time. For example, a scientific approach to healthy diet taken by a biology teacher will differ significantly from how a religious education teacher discusses cultural and religious practices around food preparation and consumption. While opportunities exist for epistemically insightful approaches that create connections, e.g. between Biology and Religious Education, many biology teachers work within education systems that compartmentalise science from other subjects (Billingsley, Nassaji & Abedin 2017), preventing the collaborative work necessary to plan and co-ordinate joined up teaching on HWB topics like diet. The near-absence of spaces for building epistemic insight creates a disjointed, challenging and fragmented experience for the student engaging with these different areas and unreasonable levels of anxiety and frustration for each of the subject teachers, particularly when engaging with sensitive topics across culturally diverse student demographics.

Further, while many teachers (including science teachers) enter the profession with the promotion of student HWB as a motivation, research has shown that lack of preparation and support limits teachers’ effectiveness as promoters of student health and wellbeing (Byrne et al. 2015). Exam-focused systems likely exacerbate these issues. In an environment of increasing responsibility and pressure on teachers, HWB elements are likely to be side-lined in favour of meeting the requirements of improving and maintaining good results. There is little research or attention been given to how student learning about HWB might be examined, since much HWB education has traditionally taken place in unexamined subjects and interventions at the fringes of the curriculum (PSHE/PSE/General Studies/one-off interventions). One argument might be that if we value HWB as an educational outcome, then we should value it enough to examine it.

Epistemic Insight

THE EPISTEMIC INSIGHT CURRICULUM FRAMEWORK

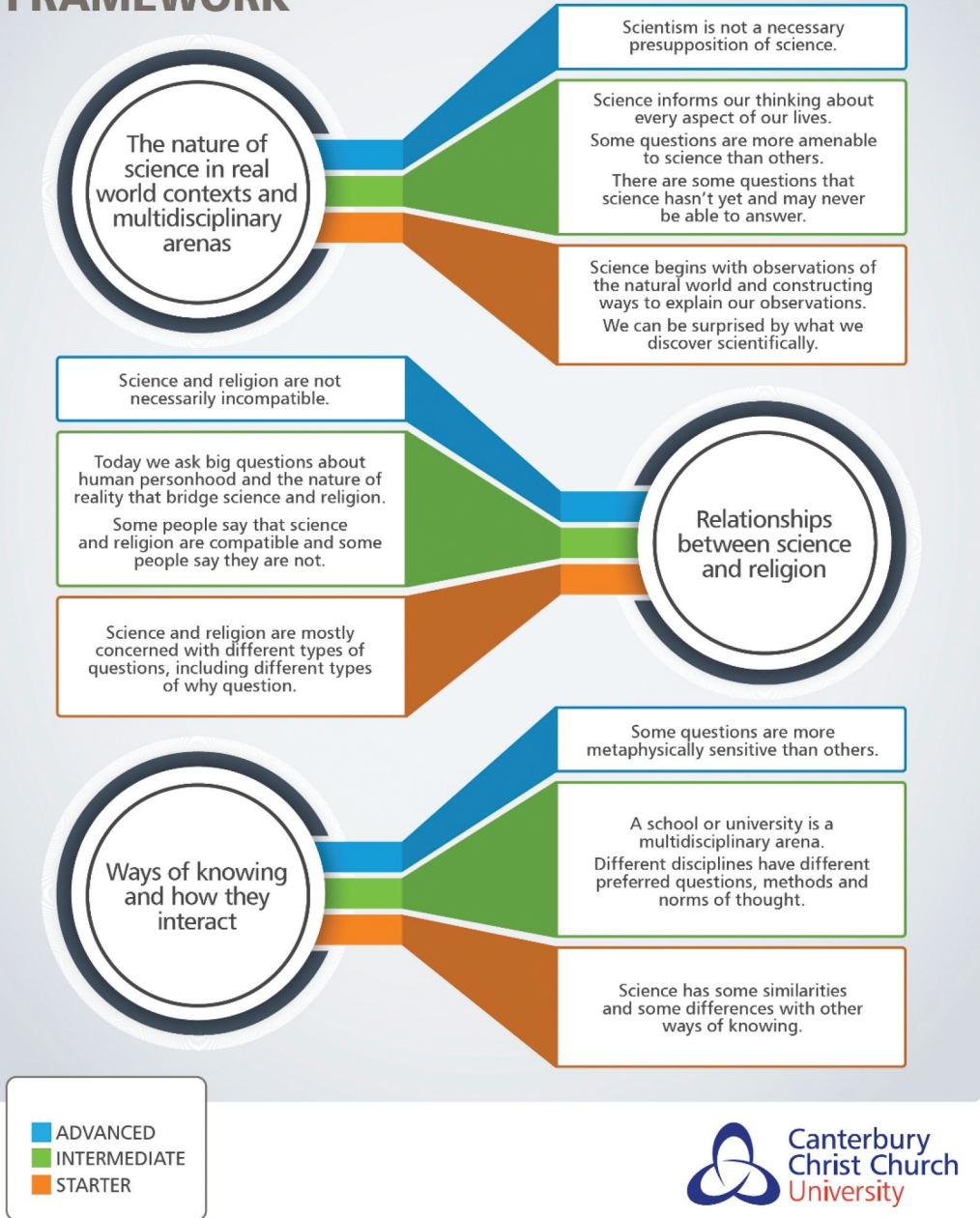


Figure 1. The epistemic insight curriculum framework (Billingsley 2021).

A central aspect of the development of HWB education concerns the development of young people's knowledge about gender, sex and sexuality, typically engaged through what academic literature broadly designates 'sexuality education' (Haberland and Rogow 2015). This covers, for example, matters of human reproduction, sexual relationships and sexual health; and less commonly, broader issues around gender stereotypes, sexual harassment & rape, LGBTQ experiences and religious and cultural influences on sexuality. This article focuses on this area of HWB education, while also recognising that health and wellbeing education concerns a much wider range of topics, including diet, physical exercise, mental health and self-image. Many of the issues relevant to biology teaching explored in this article will have similar resonances with other HWB topic areas and represent fruitful areas for further research.

Sex education and biology

Several historians of sexuality, including Jonathan Zimmerman (2015) and Lesley Hall (2012) agree that sexuality education, broadly conceived, has failed in its primary aims to adequately engage children and young people with a range of knowledge about human sexuality. Part of the reason for this failure has been compartmentalisation within a scientific perspective. In many cases, biology teachers have borne the primary responsibility for teaching sex education (Sauerteig and Davison 2008). This has meant that students' primary engagement with questions of sex and sexuality at school (if they have done so at all) has been through a scientific lens (Carter, 2001). In response to consistent evidence for the ineffectiveness of 'science-only' sexuality education (Blake and Aggleton 2017), much effort has been made in some countries in broadening the range of disciplinary lenses that schools bring to bear on sex education, supplementing the aim of a scientific understanding (McClelland and Fine 2017). These efforts have seen a measure of success in countries such as England, and sex education is now expected to be delivered as part of a wider set of interrelated topics around health and wellbeing. However, this raises anew the question of the role of the biology teacher in sexuality education as new subject areas are brought to bear on sexuality topics.

Besides the significant body of work exploring the problematic legacy of a 'biology only' approach (e.g. Parker, Wellings, and Lazarus 2009), other research has considered in greater detail the importance of biology education for education about human sexuality (Lundin 2014). However, engagement with the experience of biology teachers in navigating epistemic challenges when engaging in sensitive topics around human sexuality is limited. One area of research has focused on how portrayals of biological sex in textbooks might impact student perceptions of the relationship between sex and gender and the suitability of scientific and social scientific disciplinary approaches (Donovan et al. 2019). Other work has explored attitudes towards how or where in the curriculum human sexuality should be taught, for example, pre-service teachers attitudes regarding the suitability of biology teachers for teaching some or all of sex education (Gunay, Cavas, and Hamurcu 2015). A smaller body of work has engaged directly with the experiences of biology teachers themselves, for example, Bittner and Meisert (2021) investigated German biology teachers' attitudes to teaching students from different cultural backgrounds. Approaches drawing on curriculum analysis have explored the limiting discourses present in biology curriculum documents, e.g. in Australia (Farrelly, O'Brien, and Prain 2007). Haberland and Rogow (2015), for example, have outlined what an interdisciplinary approach to sexuality education might look like that spans biology and other disciplinary areas. However, few studies have examined specific cross-curricular connections between biology and other subject areas with a view to addressing the 'everyday' challenges faced by biology teachers teaching about sensitive areas. There is also limited comparative research on biology curricula in different national contexts (cf. Sörög et al. 2011). This makes clear the value of an exploratory cross-curricular comparison of different framings of human sexuality elements of HWB education across school subject areas.

Examples from both curriculum subjects of interdependencies with other curriculum subjects

We will first take a look at a few examples of these cross-curricular connections, using the English curriculum as an example, between biology and Relationships, Health and Sex Education. We focus here on the English context, but it is likely that exercises of this kind in other national contexts would yield similar results showing connections between sexuality education and biology. We will then consider how activities at the macro, micro and meso level of individual schools could help foster epistemically insightful approaches to both sexuality education specifically and HWB education more broadly. Our aim is to demonstrate the distinctive and important contribution of the biology teacher to an integrated HWB education, through the worked example of sexuality education, noticing the range of challenges that biology teachers face in bringing a scientific lens to bear on sensitive challenges. We then outline some potential ways forward drawing on research and development around epistemic insight.

In the following section, we group together three ‘clusters’ of linked extracts from the biology and RSHE curriculum documents. These three were selected from a wider mapping exercise as providing the most clear and salient examples of challenges for the biology teacher and how these could be addressed. This is undertaken initially in these sections at the micro-level through changes in pedagogical emphasis – meso and macro level changes are outlined in the following section.

Bridges between biology and other disciplines on RSHE topics

Reproduction

From the National Curriculum for Science, Key Stage 3, under ‘Reproduction’:

- reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta

From the RSHE Curriculum, ‘By the end of secondary school . . .’ under ‘Being safe’:

- how people can actively communicate and recognise consent from others, including sexual consent, and how and when consent can be withdrawn (in all contexts, including online).

From the RSHE Curriculum, ‘By the end of secondary school . . .’ under ‘Intimate and Sexual relationships’

- the facts about the full range of contraceptive choices, efficacy and options available.
 - the facts around pregnancy including miscarriage.
 - that there are choices in relation to pregnancy (with medically and legally accurate, impartial information on all options, including keeping the baby, adoption, abortion and where to get further help).
-

(From Department for Education *National Curriculum in England: science programmes of study* (2013) and Department for Education *Relationships Education, Relationships and Sex Education (RSE) and Health Education* (2019).

Biology teachers are typically tasked with teaching about the science of human reproduction. However, one of the key drivers behind sex education reform efforts in the UK has been teaching about sexual consent. This raises the question of which subject teacher is best positioned to teach about consent, and what might be the distinctive role of the biology teacher in a topic that does not appear to be within the remit of science. But, if the biology teacher *were* to take up the task of teaching about consent, it is fair to say that the experience, for both student and teacher, might be rather jarring. They would need to move from a scientific lens focusing on the biological processes underlying reproduction to the practical and ethical complexities of consent, a topic which manifestly requires a multidisciplinary understanding (Whittington 2021).

How might an epistemically insightful approach help the biology teacher address this challenge? A lesson on this topic could usefully be introduced using an exercise based on the epistemic insight ‘discipline wheel’ (Figure 2). This may require a preliminary discussion of what is meant by ‘disciplines’, since not all students will be familiar with this terminology.

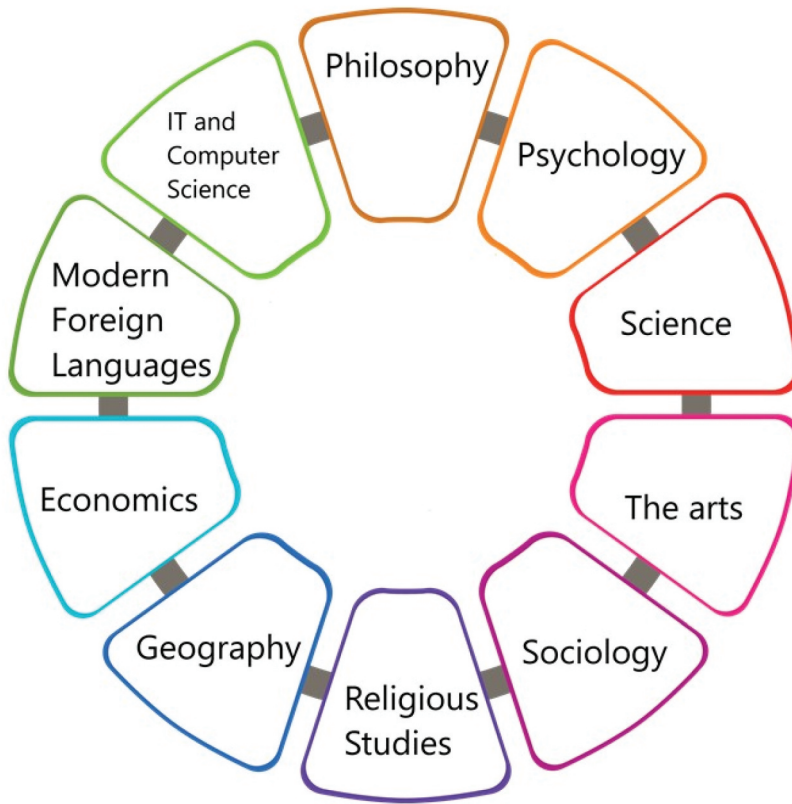


Figure 2. The discipline wheel.

The biology teacher could begin the lesson by informing students that their topic will be human reproduction. These may include a range of personally salient and sensitive topics, including consent. Since the lesson is biology, the focus is on a scientific understanding of reproduction. However, the teacher could acknowledge there are many questions in this topic that other disciplines are better equipped to answer, and some that require multiple disciplinary perspectives.

The activity could continue by gathering a range of both scientific and non-scientific questions from students regarding reproduction. Once questions have been collected, the teacher could then ask students to 'sort' questions into the discipline or disciplines best suited for answering them.

The teacher could then help students identify which questions biology *is* best equipped to answer. Ethical questions regarding consent or other aspects of intimate relationships could be identified as more amenable to other disciplinary perspectives, but on which science can still inform our thinking. The overall aim of this way of framing the topic of reproduction is to help students recognise that other disciplines have important contributions to make to the topic of reproduction. This helps establish the school as a 'multidisciplinary arena' (Billingsley et al. 2018) and works against the compartmentalisation of science as concerned with 'the facts' and divorced from the emotional and cultural meanings of human reproduction. The teacher could then proceed with the planned lesson on reproduction using a scientific lens. Prefacing the lesson with this activity is likely to lead students to ask questions that may point beyond a scientific lens. This itself is evidence of epistemically insightful thinking rather than 'irrelevance'.

It should be noted that the approach described would be significantly strengthened where schools have planned delivery of key topics to occur at similar points. This would position the biology teacher to signal, for example, that consent will be covered by another subject teacher soon. The structural changes needed to support and enable epistemically insightful teaching are discussed further below.

Sexually transmitted infections

From the National Curriculum for Science, Key Stage 4, under 'Health, disease and the development of medicines':

- communicable diseases including sexually transmitted infections in humans (including HIV/AIDS)

From the RSHE Curriculum, 'By the end of secondary school ...' under 'Intimate and sexual relationships':

- how the different sexually transmitted infections (STIs), including HIV/AIDS, are transmitted, how risk can be reduced through safer sex (including through condom use) and the importance of and facts about testing.
-

The English biology curriculum specifies teaching about sexually transmitted infections, including HIV/AIDS. The English RSHE curriculum covers the same material but worded differently (emphasis on 'how they are transmitted') and with additions of risk reduction and testing. So, the biology teacher is responsible for teaching about diseases themselves, but not explicitly for teaching about *transmission* nor *risk reduction* nor *testing*. This is in itself evidence of the compartmentalisation of science from the 'practical' matters of positive health behaviours.

This leaves the biology teacher with a difficult choice. One way to proceed would be to teach to the letter of the biology curriculum, avoiding or bracketing potential student questions (spoken or unspoken) regarding transmission, risk reduction and testing. The other would be to embrace these questions, but then run the risk of the lesson going 'off the rails', since for students, risk reduction (i.e. contraceptive use) and practical advice on getting tested are not manifestly 'scientific' topics. The biology teacher may additionally be faced with confusion or unsurety as to whether and how students are learning elsewhere about this or which staff are being tasked with addressing this area.

How might an epistemically insightful approach help the biology teacher engage with teaching about STIs? In the following we draw on the concept of team-teaching, which has a well-established research literature (see e.g. Murata 2002) which supports the development of epistemically insightful HWB education. Epistemically insightful pedagogies are ideally suited to interdisciplinary team teaching where two disciplines are set up in a 'dialogue' regarding the topic at hand. A team-teaching approach could be effective in addressing a range of HWB topics, including sexuality education topics such as STIs.

One potential collaboration is between a biology teacher and a psychology teacher. A lesson engaging with STIs could be introduced by setting the students the task of coming up with some similarities and differences between biology and psychology. These might include, for example, that psychology is engaged (though of course not exclusively) with questions of *subjective* human experience, while biology is more concerned with *objective* description of (human) biological phenomena. However, both (though perhaps less so in the more humanistic psychological traditions) place epistemic value on transparency, replicability and consensus.

The lesson itself could be established around the question 'How are STIs transmitted?' with the acknowledgement that both biology and psychology can address this question. As expected, the biology teacher would engage students with the biological elements of STI transmission, while the psychology teacher could present a psychological perspective on what factors might stop people from either using contraception or getting an STI test. Later on in the lesson, a further layer of discussion could consider the neurobiological correlates of psychological perspectives on the feelings of shame and stigma around being tested for STIs. Working together, the biology and psychology teacher could engage students in discussion of the role of neurochemicals in the

experience of shame and stigma and identify other potential disciplinary contributions (using e.g. the ‘Discipline Wheel’, discussed above).

As with the use of the ‘Discipline Wheel’ above, there are wider conditions that are needed to enable and support interdisciplinary team teaching and its place in an epistemically insightful health and wellbeing education. In the English context, Initial Teacher Education for secondary science is not well set up to facilitate epistemically insightful science education, since it is governed by the normalised compartmentalisation of science education in the English school system. Having some preparation in epistemically insightful thinking about disciplines would prepare teachers to address the similarities and differences, for example, between biology and psychology, and create spaces for students to develop their own understanding about the power and limitations of different disciplines for particular topics and questions related to sexuality and sexual health.

Sex & gender

From the National Curriculum for Science, Key Stage 4, under ‘Evolution, inheritance and variation’:

- sex determination in humans

From the RSHE Curriculum, ‘By the end of secondary school . . .’ under ‘Respectful relationships’:

- how stereotypes, in particular stereotypes based on sex, gender, race, religion, sexual orientation or disability, can cause damage (e.g. how they might normalise non-consensual behaviour or encourage prejudice)
-

In England, as it is likely to be the case elsewhere, biology teachers are tasked with teaching about sex determination in humans. In a culture in which issues of sex and gender are constantly at the forefront of the news media cycle, this presents a range of potential difficulties. Additionally, in many countries, it is becoming increasingly common for students experiencing some measure of gender dysphoria to be self-identifying as transgender, and potentially expressing their identity through their self-presentation (e.g. clothes/hair/makeup) and preferred pronouns (Alegría, 2016). Questions regarding the stability of apparently binary ‘biological sex’ are at the frontiers of current scientific research (e.g. Blencowe et al. 2022). Student questions about this area, though they may be experienced as potentially disruptive attempts to ‘derail’ the lesson, are more likely to arise as a point of genuine curiosity and possibly driven by significant personal salience.

The biology teacher may feel that the scientific approach they take does not allow space for the questions many students are likely to have. It appears however, that the RSHE curriculum does allow space for these questions under the remit of discussing ‘stereotypes based on sex, gender . . .’ etc. Again the biology teacher may feel caught in a double-bind – either they soldier through teaching a ‘textbook’ account of human sex determination, feeling perhaps some sense that they are selling their students short on the possibilities of deeper enquiry, or they brave these more personal and cross-disciplinary questions about sex and gender and risk entering territory they do not feel is appropriate for a science lesson, or which they are not equipped to navigate. We note here that much of what we are articulating is based on assumptions regarding the experience of the biology teacher. This highlights the pressing need for research with biology teachers that captures some of the challenges and opportunities at the ‘coal face’ of this work.

How might an epistemically insightful approach help the biology teacher work at this ‘messy’ interface of teaching about sex & gender? One potentially useful tool, drawing from epistemic insight research, could be to frame the lesson with an exercise in understanding the power and limitations of science (language which is specified in the English National Curriculum for Science and in the US’s New Generation Science Standards – see McComas 2014). The teacher could first work with students to generate a range of different question types related to sex and gender. Once these are gathered, the teacher could introduce the ‘Bubble tool’ (Figure 3.), a way of judging and organising the amenability of questions to scientific investigation. Students could then use the Bubble Tool to sort the sex & gender questions into those that are more or less amenable to science.

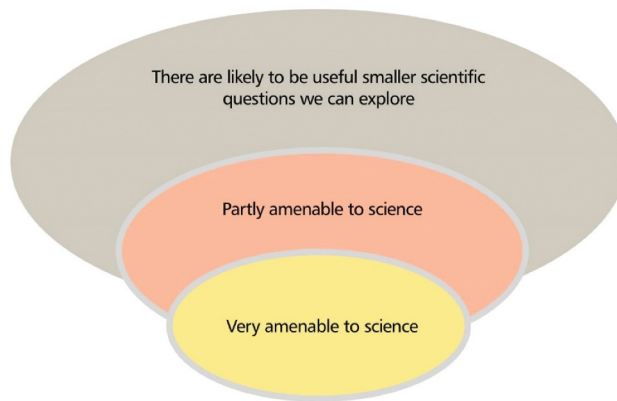


Figure 3. The bubble tool.

Students may notice, for example, that questions regarding how human sex is determined and manifests secondary sexual characteristics are amenable to science, but the question of what these characteristics do or should mean culturally is less amenable to science, requiring ethical, sociological and historical lenses. Crucial is the third, largest bubble in the tool. Here the point is not to dismiss the role of science/biology but instead to emphasise that these Big Questions are less amenable to science, *and* that science informs our thinking about these Big Questions by providing answers to carefully framed empirical questions.

We have discussed three topics that map across the English biology curriculum and the RSHE curriculum – reproduction, sexually transmitted infections and sex/gender. While biology constitutes a scientific lens on the topic, their framing within the RSHE curriculum implies the requirement of a range of disciplinary perspectives. This creates a challenge for the biology teacher, working in a compartmentalised school system. Drawing on concepts and tools from research into epistemic insight, we identified some ways in which biology can and should inform students' thinking on health and wellbeing topics that are not necessarily purely scientific in scope.

In the course of this discussion we have made reference to the need for supportive structures that enable a more epistemically insightful health and wellbeing education. In what follows, we draw on and adapt Scheerens (1990) organisational model of school effectiveness, to consider structural changes at the macro-, meso- and micro-level of a school that could help confront some of these challenges by facilitating epistemically insightful approaches to teaching about HWB.

Practical steps to creating cross-disciplinary bridges in schools

Macro-level actions: school/organisational level

Create regular time for teachers across subject areas to plan delivery

Action taken by school leadership could create time and space for ongoing conversations about the delivery of HWB topics across curriculum areas. This might, for example, involve a regular cross-departmental meeting focused on teaching, with the wider intention to facilitate a range of conversations across subject teachers about connections across their disciplines on various topics, including but not limited to HWB. Meetings could bring together teachers from different subjects with HWB content to discuss how content will be covered in a complementary way using their distinctive disciplinary approaches. An important exercise in this space might be to 'map' how HWB-relevant topics are being covered across curriculum areas, which may include biology, but also PSHE/PSE, English, citizenship, computer science, and PE. Further planning might involve, for example, ensuring that the biology and the PSHE teacher are both teaching about puberty in the

same week. The planning would also require establishing how a scientific approach taken by the biology teacher might work together with, e.g. a sociological/psychological or personal knowledge framework that might be applied by the PSHE teacher. This would then require support at the meso-level to ensure communication is maintained and the micro level to ensure bridges between classrooms are created. Many schools will be very limited in their capacity to create this extra space, so creativity may be needed as to how cross-departmental conversations could be enabled within existing processes.

Meso-level actions: peer-to-peer level

Regular communication with other subject teachers teaching topics with a different disciplinary lens

Besides the creation of more formal space for cross-subject planning, a wider change in the school culture towards breaking down the barriers between teachers of different subjects would have the effect of enabling the informal and ongoing communication required to sustain a 'joined-up' approach. Ongoing communication between, for example, the biology teacher and the PSHE teacher, will be needed to ensure that potential confusions and contradictions are addressed. Since the 'joining up' work is inherently complex and challenging, there is likely to be feedback needed to strengthen cross-disciplinary connections and account for different successes and failures of engaging student learning.

Enabling team teaching

We have already discussed how team teaching might engage effectively with a sexuality education topic. However, numerous barriers exist to the actual effective implementation in schools, including the entrenched compartmentalisation inherent in school systems and the practical constraints of timetabling and workload allocation. Some research has engaged with the formation and implementation of interdisciplinary teaching teams (e.g. Crow and Pounder 2000). However, further research is needed to establish the range of potential benefits of team teaching, including measurable attainment but also beyond instrumental value to consider the broader ethos of the school. Consistently experiencing two teachers from different subjects teaching a subject together has potentially profound consequences for their educational experience. While single discipline subject teachers (like biology) may be limited in their capacity to lead an enquiry that enters other disciplinary spaces, working together with both other single-discipline subjects and with subjects that are less disciplinarily constrained, can enrich and deepen this work.

Creation of networks that enable engagement with research

More formally at the meso level, teachers could set up intra-school 'working groups', to facilitate engagement with research on various health and wellbeing topics. This could form part of the growing call for 'research-engaged teachers' within English education policy discourse (Lambert 2018). Again, this would require strong leadership to create a culture that supports this work that is otherwise likely to be perceived as 'extraneous' and therefore easily forgotten amongst the various demands of school life. Research engaged 'working groups' would provide a potentially rich range of resources for sustaining within- and cross-disciplinary teaching on areas that are in a 'frontier' area of scientific or humanistic inquiry (like sex and gender).

Micro-level actions: classroom teaching

Use of language that supports bridges to other subjects

We have already discussed how tools and concepts from epistemic insight research could be implemented in classroom teaching (e.g. introducing topics using a question that bridges two or more disciplines). Thinking more broadly about challenges to epistemically insightful teaching, it is worth noting that single discipline teachers like biology teachers may not have the time or space to facilitate a multidisciplinary inquiry that would take them beyond the scope of their disciplinary approach and required learning objectives. However, when paired with meso/macro level activities that carry through the vision for integration, they can use language to frame questions and problems in a way that supports and facilitates other subject teachers to pick up/revisit topics (including non-discipline-specific subjects like Religious Education and Citizenship). Simply indicating to students 'I know you have been looking at this in your x lesson' can help remind students of how/in what way the topic might have been covered in that lesson (i.e. using particular disciplines. This can help students to see what the scientific approach they are about to take in their biology can and cannot contribute to the topic. Even a small change such as this could go a long way towards creating a less fragmented experience for students learning about HWB in schools.

Conclusions and recommendations for future research

In this article, we have explored the important role that the biology teacher plays in shaping an epistemically insightful approach to HWB education, through a case study comparing the biology and RSHE national curricula in England. We showed how different mappings of sexuality education topics across the two areas create complexities for the biology teacher when working within a compartmentalised system. We suggest that similar 'bridges' can be observed in a range of other education systems worldwide, with similar challenging blockages to a 'joined up' experience for the student. We then suggested activities at the macro, meso and micro level of the school that could help foster a more epistemically insightful approach to HWB education. Our intention here has been to demonstrate the vital role of the biology teacher in supporting an integrated HWB education and to discuss some ways to better harness that potential in a less compartmentalised system.

We have relied in much of this article on anecdote and assumption regarding the challenges and frustrations faced by biology teachers in this area. There is a lack of research into the experiences of biology teachers engaging students with sensitive areas and the potential role of cross-curricular integration for addressing this. This paper has helped to highlight and articulate the potential importance and power of future research in this area for developing the integrated HWB education being promoted at different levels of global education policy making. Further projects could focus on co-creating strategies for biology teachers to facilitate epistemically insightful learning about HWB.

Another important next step would be, as we suggested in our introduction, to develop approaches to assessment of HWB. These would need to clearly separate HWB outcomes, (e.g. reported levels of anxiety, perceptions of body image) which cannot be 'examined', from the knowledge and understanding of HWB provided through the ideal integrated, cross-curricular, whole school HWB education. Developing ways of assessing epistemic insight, including, e.g. assessing students' recognition of the power and limitations of science for informing our thinking about HWB topics, will be central to this task.

A final recommendation for future research would be a comparative study of biology curricula internationally. This would be valuable for supporting further studies in this area with a wider perspective on existing similarities and differences in approaches.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Templeton World Charity Foundation.

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Declarations

No competing interests to report.

This work was supported by Templeton World Charity Foundation, grant number 0225.

Ethical approval by Canterbury Christ Church Ethics Committee.

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